Remarks

Claims 1, 3-8 and 11-24 were pending. Claims 1, 5, 22 and 24 will be amended upon entry of this communication. Claims 3 and 4 have been cancelled. Reexamination and reconsideration are requested.

On page 2 of the Office Action, claim 3 was objected to under 37 C.F.R. § 1.75(c). The Examiner's observations are well taken. Accordingly, claim 3 has been cancelled. Claim 4 cited the same calcium-phosphate ratio as Claim 1 and is now canceled.

Claims 1, 3-8 and 11-21 were rejected under 37 C.F.R. § 112, ¶ 2 as being indefinite. The Examiner made specific reference to the recitation of calcium. To eliminate any confusion, the recitation of calcium has been deleted from the next-to-last paragraph of claim 1.

On page 4 of the Office Action, claims 22-24 were rejected under 35 U.S.C. § 102(b) as being anticipated by Sonoda et al. for the reasons given in the previous Office Action.

The Sonoda et al. patent is directed to a process for forming a lubricative film for cold working on titanium and titanium alloy substrates. In contrast, the present invention is limited to the metal substrates that exclude titanium. The substrates used are: steel (Type S45C), austenitic stainless steel (Type SUS304), and aluminum (Type A6061). Specification, p. 12, ll. 5-8. There are no working examples of titanium.

Sonoda et al. states that

> In cold working metal, use is generally made of a lubricant to impart lubricity, so as to prevent seizure, i.e., to prevent direct contact of a tool and material being worked. In the case of steel, for example, oil containing an extreme pressure agent is used in comparatively light working and a soap or solid lubricant in addition to a phosphate to oxalate is used in heavy working. . . . Unfortunately at the present time there was no satisfactory lubricant that is suited to the various working processes in the case of titanium and titanium alloys.
>
> '480 patent, 1:14-28.

Thus, the '480 reference itself indicates a lack of transference to ferrous substrates of processes that are unique to titanium-based substrates.

In the present case, claim 1 has been amended so that the metal substrate "is devoid of titanium and titanium alloys." Accordingly, the rejection of the § 35 U.S.C. 102(b) as being anticipated by Sonoda et al. no longer applies.

Claim 5 has been amended so that it depends from claim 1. Claims 5-8 rise or fall therewith. Similarly for claims 11-24.

On page 4 of the Office Action, claims 1, 3-8 and 11-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sonoda et al. and further in view of Shimakura et al. and Witte.

The differences between claim 1 and the Sonoda et al. reference were discussed above. Claims 5-8 and 11-18 now depend from and incorporate the limitations of claim 1.

In addition to those differences, Applicants respectfully challenge the *prima facie* assertion of obviousness because of the differences between the cited references and the claimed invention as now claimed, as discussed above. Thus, as combined, the references

would fail to teach the claimed invention, even if properly combinable. Under § 103, the teachings of references can be combined only if there is some suggestion or incentive to do so. (Citations are omitted.) There is no such suggestion or incentive that is disclosed in any of the references which the Examiner proposes to combine. Nor is there any rationale expressed by which a person of ordinary skill in the relevant art would have been motivated to combine the references to arrive at the claimed invention.

In summary, in a process for forming a lubricative film for cold working with a metal substrate, titanium-based surfaces require a unique treatment, and evident from the limitation of Sonoda et al. to a "process for treatment of titanium and titanium alloys", for which they received U.S. Patent No. 4,874,480. The art and science of such processes are not transferable to the art and science of dealing with ferrous surfaces. Simply stated, the skills involved in phosphating a titanium surface are not equivalent to those involved in phosphating a steel surface.

Finally, on page 5 of the Office Action, the Examiner observes that "the rejection under 35 U.S.C. 103 previously applied to claim 10 is maintained . . ." Applicants respectfully observe that claim 10 was cancelled in the Office Action dated April 22, 2001.

All formal and substantive requirements of patentability are now believed to be met. A Notice of Allowance is therefore solicited.

Respectfully submitted,

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Attachment

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Claims:

Please amend claims 1, 5, 22 and 24 as shown below:

1. (Thrice Amended) A process for forming a lubricative film for cold working on a metal substrate, said process comprising the following operations:

(I) bringing said metal substrate that is devoid of titanium and titanium alloys into contact with an aqueous electrolyte solution comprising water and:

(A) at least 20 g/l of dissolved zinc cations;

(B) at least 20 g/l of dissolved phosphate anions; and

(C) at least one dissolved auxiliary acid other than phosphoric acid, said auxiliary acid having at least a first ionization constant that is greater than the third ionization constant for phosphoric acid; and, optionally, other constituents as detailed further below,

this aqueous electrolyte also being in contact with a counter-electrode that is not said metal substrate to be cold worked, so that an electric current can pass through the counter-electrode as anode, the aqueous electrolyte solution by ionic conduction, and said metal substrate as cathode;

(II) passing through said metal substrate while it remains in contact with said aqueous electrolyte solution an electric current that has a net cathodizing character at said metal substrate for a sufficient time to form an adherent solid phosphate conversion coating over said metal substrate;

(III) discontinuing contact between said aqueous electrolyte solution and said metal substrate bearing said adherent solid phosphate conversion coating; and

(IV) applying to the exterior surface of said solid phosphate conversion coating, when it is not in contact with said aqueous electrolyte solution, a water- or oil-based lubricant coating,

the aqueous electrolyte solution having a pH value at least as low as the pH value of a hypothetical reference electrolyte solution that contains the same actual amounts of dissolved zinc and phosphate ions as does said aqueous electrolyte solution and in addition contains at least 30 g/l of nitric acid as its only auxiliary acid;

at least one type of divalent or trivalent metal ions selected from a group consisting of magnesium, aluminum, [calcium,] manganese, chromium, iron, nickel, and copper; and

a concentration of calcium ions such that the molar ratio of calcium ions to zinc ions is from 0.1:1 to 2:1.

5. (Amended) A process according to claim [4] 1, before operation (I), said substrate is acid pickled and then rinsed with water.

22. (Amended) A process for forming a lubricative film for cold working on a metal substrate, the process comprising the following operations:

(I) bringing the metal substrate that is devoid of titanium and titanium alloys into contact with an aqueous electrolyte solution comprising water and;

(A) at least 20 g/l of dissolved zinc cations;

(B) dissolved phosphate anions; and

(C) at least one dissolved auxiliary acid other than phosphoric acid, the auxiliary acid being present in an amount of at least 30 g/l and having at least a first ionization constant that is greater than the third ionization constant for phosphoric acid; and, optionally, other constituents as detailed further below,

this aqueous electrolyte also being in contact with a counter-electrode that is not the metal substrate to be cold worked, so that an electric current can pass through the counter-electrode as anode, the aqueous electrolyte solution by ionic conduction, and the metal substrate as cathode;

(II) passing through the metal substrate while it remains in contact with the aqueous electrolyte solution an electric current that has a net cathodizing character at the metal substrate for a sufficient time to form an adherent solid phosphate conversion coating over the metal substrate;

(III) discontinuing contact between the aqueous electrolyte solution and the metal substrate bearing the adherent solid phosphate conversion coating; and

(IV) applying to the exterior surface of the solid phosphate conversion coating, when it is not in contact with the aqueous electrolyte solution, a water- or oil-based lubricant coating.

24. (Amended) A process according to claim 23 wherein the aqueous electrolyte solution in operation (I) comprises [at least 20 g/l of dissolved zinc cations and] at least 20 g/l of dissolved phosphate anions.